

What is claimed is:

1. An immobilized liquid membrane comprising:  
a substrate;  
a plurality of capsules disposed on the substrate, each of the capsules permeable to a first gas of a mixture of gasses comprising the first gas and a second gas, each of the capsules substantially impermeable to the second gas; and  
a liquid disposed in each of the capsules that is permeable to the first gas and substantially impermeable to the second gas.
2. The immobilized liquid membrane of claim 1, wherein the capsules are microcapsules.
3. The immobilized liquid membrane of claim 1, wherein the liquid is a volatile liquid or a substantially nonvolatile liquid.
4. The immobilized liquid membrane of claim 1, wherein the liquid is an ionic liquid, a solution of sodium glycinate in glycerol, or water.
5. The immobilized liquid membrane of claim 1, wherein the substrate is permeable to the first gas and substantially impermeable to the second gas.
6. The immobilized liquid membrane of claim 1, wherein the first gas is carbon dioxide.

7. The immobilized liquid membrane of claim 6, wherein the second gas is at least one of oxygen, nitrogen, and carbon monoxide.
8. The immobilized liquid membrane of claim 1, wherein the substrate is porous.
9. The immobilized liquid membrane of claim 1, wherein the capsules are chemically bonded to each other and to the substrate.
10. The immobilized liquid membrane of claim 1, wherein the capsules are of polyvinyl chloride or polystyrene.
11. An immobilized liquid membrane capable of separating carbon dioxide from at least one other gas in mixture therewith, the immobilized liquid membrane comprising:
  - a porous substrate of a material that is permeable to the carbon dioxide and substantially impermeable the at least one other gas;
  - a plurality of capsules disposed on the substrate, each of the capsules permeable to the carbon dioxide and substantially impermeable the at least one other gas;
  - and
  - a liquid disposed in each of the capsules that is permeable to the carbon dioxide and substantially impermeable the at least one other gas.
12. The immobilized liquid membrane of claim 11, wherein the liquid is an ionic liquid, a solution of sodium glycinate in glycerol, or water.

13. The immobilized liquid membrane of claim 11, wherein the capsules are of polyvinyl chloride or polystyrene.
14. The immobilized liquid membrane of claim 11, wherein the at least one other gas is at least one of oxygen, nitrogen, and carbon monoxide.
15. A method for manufacturing an immobilized liquid membrane, the method comprising:
  - encapsulating a liquid in each of a plurality of capsules, each of the capsules and the liquid permeable to a first gas of a mixture of gasses comprising the first gas and a second gas, each of the capsules and the liquid substantially impermeable to the second gas;
  - disposing the liquid-containing capsules on a porous substrate;
  - permeating the porous substrate and the liquid-containing capsules with a monomer; and
  - polymerizing the monomer to chemically bond the capsules to each other and the porous substrate.
16. The method of claim 15, wherein permeating the porous substrate and the liquid-containing capsules with the monomer comprises exposing the porous substrate and the liquid-containing capsules to vapors of the monomer.
17. The method of claim 15, wherein permeating the porous substrate and the liquid-containing capsules with a monomer comprises using an ultraviolet-light sensitive monomer.

18. The method of claim 17, wherein polymerizing the monomer is initiated by exposing the porous substrate and the liquid-containing capsules to ultraviolet light.
19. The method of claim 15, wherein permeating the porous substrate and the liquid-containing capsules with a monomer comprises using a monomer of the material of the capsules.
20. The method of claim 15, wherein encapsulating a liquid in each of a plurality of capsules comprises encapsulating the liquid in each of a plurality microcapsules.
21. The method of claim 15, wherein encapsulating a liquid in each of the plurality of capsules comprises encapsulating an ionic liquid, a solution of sodium glycinate in glycerol, or water in each of the plurality of capsules.
22. The method of claim 15, wherein the first gas is carbon dioxide.
23. A method for manufacturing an immobilized liquid membrane, the method comprising:
  - encapsulating a liquid in each of a plurality of microcapsules, each of the microcapsules and the liquid permeable to a first gas of a mixture of gasses comprising the first gas and a second gas, each of the capsules and the liquid substantially impermeable to the second gas;
  - disposing the liquid-containing microcapsules on a porous substrate;
  - exposing the porous substrate and the liquid-containing microcapsules to vapors of an ultraviolet-light sensitive monomer; and

exposing the porous substrate and the liquid-containing microcapsules to ultraviolet light to initiate polymerization of the monomer to chemically bond the microcapsules to each other and the porous substrate.

24. A method of separating gasses, the method comprising:
- passing a first gas of a mixture of gasses comprising the first gas and a second gas through each of a plurality of capsules disposed on a porous substrate, wherein each of the capsules comprises:
- a shell that is permeable to the first gas and substantially impermeable to the second gas; and
- a liquid contained within the shell that is permeable to the first gas and substantially impermeable to the second gas; and
- passing the first gas through the porous substrate wherein the porous substrate is permeable to the first gas and substantially impermeable to the second gas.
25. The method of claim 24, wherein the first gas is carbon dioxide.
26. The method of claim 25, wherein the second gas is at least one of oxygen, nitrogen, and carbon monoxide.